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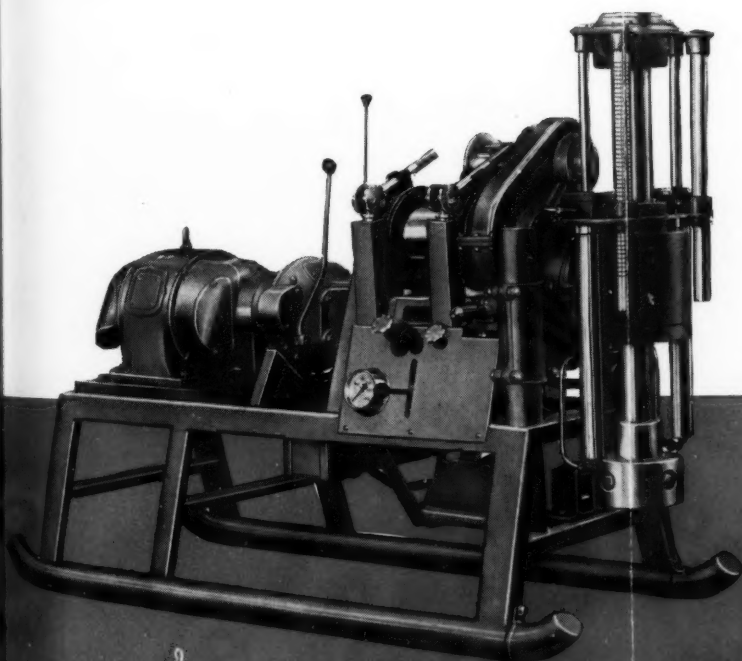
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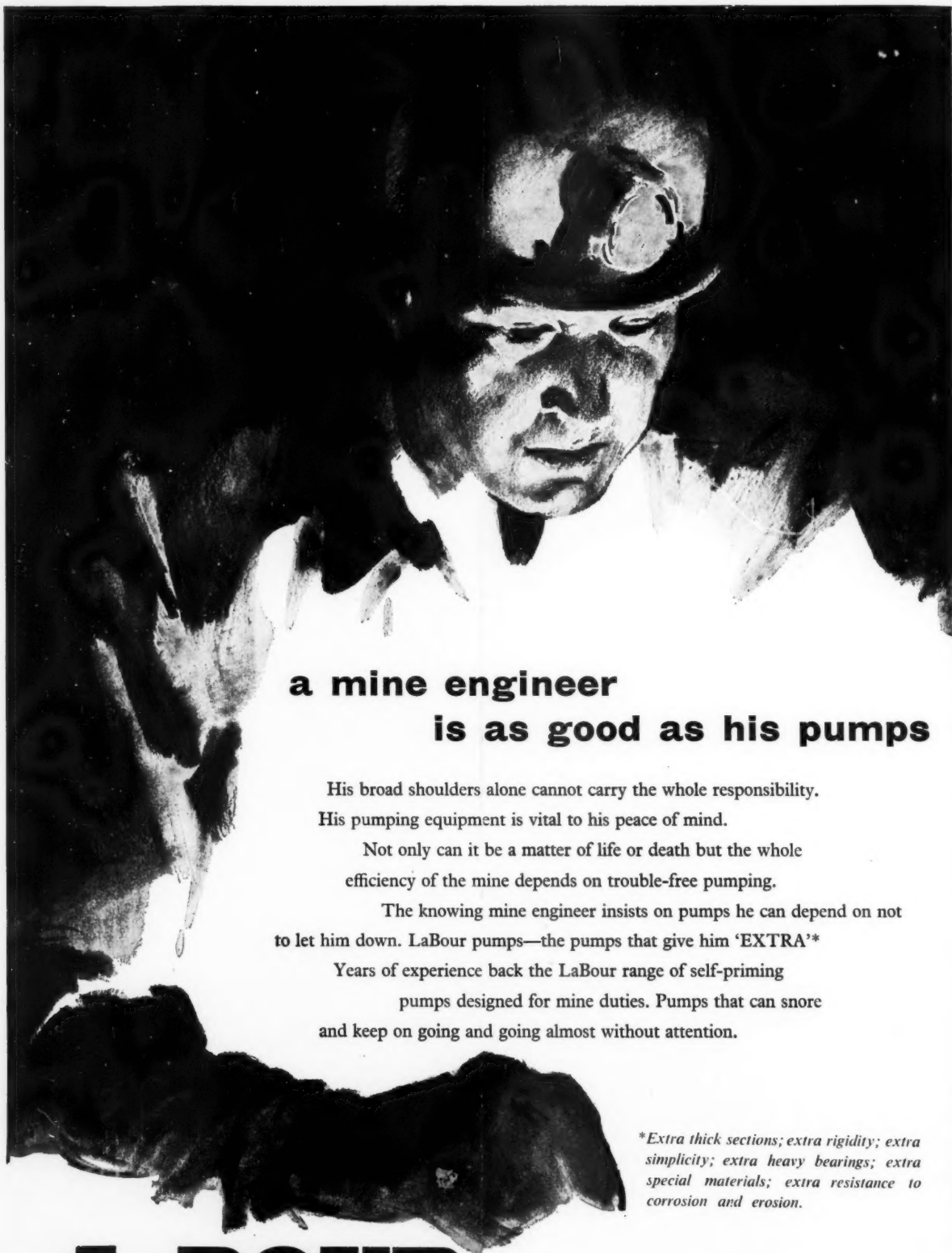
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The Mining Journal

London, January 9, 1959

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Writing in the Sky

THE year now beginning has opened dramatically with the Russian achievement of putting into orbit the first man-made planet, which is expected to travel round the sun for ever, unless it collides with another celestial body.

With sputniks and planets the mining industry is as yet not directly concerned, except as the primary source of most materials used in their construction. As to the future, who now can reject as untenable the possibility that some day the Cornish miner may find new outlets for his pioneering abilities on the Moon or Mars? Dare we visualize an interplanetary service of spaceships bringing iron ore from the Pleiades to the steelworks of Scunthorpe and the Ruhr? Economically such an undertaking, even if technically feasible, could scarcely be contemplated at current ore and metal prices, but it is the need which determines the price, and even the limitless resources of Quebec and Labrador are not so inexhaustible as to support indefinitely a constantly rising level of steel production.

It is possible that exploration for lunar oilfields may provide opportunities for future speculation, for the data transmitted from Planet III provides evidence that natural gas is escaping on the moon's surface. We await with interest the appearance of the first prospectus!

Bringing our attention more firmly back to Earth, and to the exigencies of the existing political and economic situation, let us hail Planet III—as the Soviet space rocket is apparently termed—as a spectacular—and timely—reminder that the challenge to Western supremacy is by no means confined to outer space. In the light of sputniks and Planet III, there is little place for scepticism as to the capabilities of Soviet scientists in such other new fields as controlled thermo-nuclear fusion, atomic power engineering and automation. While it is in probing outer space that the Russians have achieved the most spectacular successes, there is in all probability no great disparity in the general level of scientific and technological achievement on either side of the Iron Curtain.

Production-wise, the West has even less cause for complacency, particularly having regard to the recession from which we are only now emerging. During 1958 the output of the U.S. steel industry fell for a period to less than half installed capacity, unsold coal stocks in Britain and Western Europe rose by millions of tons, and the prosperity of non-industrial countries in the Free World was undermined by falling commodity prices and reduced demand.

Last year U.S. mines and oilwells yielded \$16,400,000,000 of minerals—almost \$1,800,000,000 below the value of 1957 production. The decline was due in part to lower average prices and in part to cutbacks in the volume of production. Production of Canadian minerals registered its first annual decline in 15 years, the total value of last year's output being estimated at \$2,122,153,000—a fall of 3 per cent from the previous year's record of \$2,190,322,000.

In the same year that industrial output was declining in the West, it rose very rapidly in the Soviet Union and in all Eastern

countries with the exception of Hungary. According to the central statistical board of the U.S.S.R. Council of Ministers, 8,000,000 tons of coal, about 1,500,000 tons of oil and 2,600,000,000 kWh. of electricity were produced over and above the 1958 plan targets. More than 1,000,000 tons of steel and over 1,000,000 tons of ferrous rolled stock were produced over and above the target figures. It is further claimed that the year's target for the output of non-ferrous metals of major importance was also exceeded. In Poland, the production plan for the first nine months of 1958 was fulfilled with a surplus of 990,000 tons of coal. This year's target is 97,000,000 tons—3,500,000 tons more than was planned for 1958. In Bulgaria, industrial output rose by 18 per cent during the first six months of last year, as compared with the corresponding period of 1957, the largest increases being in the fields of mining and metallurgy.

The available evidence indicates that in no other country is the tempo of mining expansion more rapid than in China. It is now claimed that Chinese coal production was doubled last year, reaching 270,200,000 tons. The steel drive also appears to have been quantitatively successful, though at the expense of quality and of serious difficulties in other sectors of the economy.

Whatever niggers may lurk in the Communist woodpiles—and niggers there certainly are—these are impressive achievements. Yet they are dwarfed by the magnitude of the increases projected in the current long-term plans. In the seven-year period 1959-1965, Russia plans to put into operation, including the reconstruction of existing enterprises, coal pits and opencast mines with a total capacity of 196,000,000-212,000,000 tons. Over the next 15 years it is envisaged that the country's key industries will more than double or treble their output. In comparison with 1957, iron ore production is planned to increase roughly three and a half times, oil four times, the output of pig iron and steel by 130 per cent, and that of electricity by 330 per cent.

In his report to Congress last November, Mr. Krushchev stated that the U.S.S.R. had outstripped Britain, Western Germany and France in the actual volume of production of pig iron, steel, coal, and electricity and had gone a considerable way towards catching up with the United States in the output of iron and steel, iron ore and coal. He claimed that between 1937 and 1958, the volume of industrial output of the Communist economic system had increased nine and a half times, whereas in the same period the industrial output of the capitalist countries had not even doubled.

Scarcely less ambitious are China's economic hopes. According to Mr. Liu Shao-chi, Secretary-General of the Party, China will outstrip Britain as a major industrial power in less than the officially promulgated period of 15 years.

Enormous quantities of metals and minerals will obviously be needed to support the fantastic increases in production envisaged in the Communist long-term plans. Initially, Russia and China will obtain the bulk of their requirements from domestic sources, as did the United States at a corresponding period of its industrial growth. It cannot be so very many years, however, before both countries join in the world-wide search for metals and minerals that has already been precipitated by the expanding requirements of the Free World's industrial powers. Already, Russia is chief importer of certain metals. Where are the supplies coming from to satisfy all demands?

In important respects the economic advancement of Russia, China and the satellite countries is by no means wholly unfavourable for the West. Apart from opening up new and expanding markets for industrial machinery and equipment, it can scarcely fail to bring about a gradual

improvement in living standards which, in time, may lead to a radical change in political thinking.

It may be taken for granted that, so far as space exploration is concerned, the Free World—as represented initially by the United States—will soon be blazing its own inter-planetary trails. What is perhaps more important is that we should not let ourselves be outstripped by the Communist countries in our own home base as Earth might now be aptly termed.

With their more complex and advanced economies, the Western powers cannot expect rates of industrial expansion comparable with those envisaged in Russia's long-term plan. It is, nevertheless, a sorry advertisement for free enterprise ("freedom", in this instance, being essentially a relative term) that, at a time of growing populations and rising living standards, industrial production should have levelled off or even declined. Simple arithmetic indicates that economically the days of Western supremacy are numbered, unless the forward momentum of the earlier post-Korean years can be recaptured and retained. Who can doubt that the potentialities for continued expansion are limited only by our own capacity to perceive and grasp them?

BLUEPRINT FOR NORTHERN MANITOBA

In 1956, the Manitoba Government of that time was being urged to speed up the northern development of the Province. To satisfy the critics, it commissioned a United States firm of economists, Arthur D. Little Inc., to undertake an economic survey of Northern Manitoba and make recommendations for its development. This has resulted in a constructive and imaginative report in which particular attention is devoted to the creation of favourable conditions for mining development.

Northern Manitoba's major economic resources are mineral deposits, extensive forests, and a hydro-electric industry capable of development. It is considered that economic growth will depend on the rate at which these three major resources are developed.

The region is traversed by an area of very great mineral promise which has already attracted international attention. Its future productivity will depend largely upon the rate of mineral discovery.

Although considerable success in mineral discovery has been achieved in recent years, the report emphasizes that knowledge of the scientific characteristics of mineral deposits is still inadequate. Increased basic scientific work on mineral deposits would be extremely beneficial, since it would ensure greater mineral discovery and expanded mining activity.

Because of the nature of the overburden in the pre-Cambrian field, Manitoba is regarded as having a particularly important stake in the development of new exploration techniques; hence, increased scientific study of Northern Manitoba's mineral deposits is recommended.

Because certain areas of Northern Manitoba are inaccessible by road or rail transportation, the report recommends that the government should offer special exploration concessions to companies willing to undertake extensive exploration programmes. It is considered that these concessions should be accompanied by government undertakings to contribute to the cost of constructing the transportation facilities that may be necessary in the case of subsequent development. Financial assistance in the construction of new towns might be of value in attracting the interest of small mining companies.

The economists found that perhaps the most important single factor discouraging economic growth in Northern Manitoba was the very high level of rail freight charges, quoted freight rates sometimes being two or three times as high as those charged elsewhere in Canada. An important recommendation, therefore, is that the government should take steps to reduce this impediment to the economic development of the region.

The establishment of a Northern Development Board is proposed. This board should be charged with the responsibility of formulating government policy and ensuring that it is properly implemented. With a development fund at its disposal, it should be a policy-making and planning body that would work through the departments of the governments concerned with the problems of northern development.

Under the heading of Mining and Metal Processing, the report makes the following recommendations:

The Manitoba Government should request the Hudson Bay Mining and Smelting Co. to make its services as a custom smelter of copper concentrates available to mines in Manitoba.

The present geological mapping (on a scale of one-half or one mile to the inch) of areas that appear favourable in the reconnaissance mapping conducted by the Federal Government or by private companies should be increased.

The government should seek methods of working with the mining industry towards the goal of a shared programme of basic research on sub-surface media in place, as well as the effects of boundaries, natural and induced fields, chemical effects, and a number of other subjects which are fundamental to the development of exploration technology. Improvements in techniques and instruments, however, should be left to private concerns.

The Director of Mines' authority to grant geophysical reservations (Section 78 of the Mining Regulations) should be extended to cover the entire Province. The government should also consider legislation to permit:

- (a) Exclusive exploration permits covering specific tracts of land with terms to be negotiated according to the remoteness and other characteristics of the area;
- (b) Specific concession areas (as an alternative to (a)), in which the area is selected by the Department of Mines and Natural Resources, an announcement being made of the terms, privileges, and incentives offered for each area; and
- (c) The negotiation of certain rights, privileges, and government support to accompany the exploration permit or concession as an incentive to exploration companies, particularly those in remote areas. Items should include water and power rights, tax exemptions, guaranteed road construction in the event of discovery of specified magnitudes of ore reserves, and long-term assistance for town-site and housing developments.

The government should publicize the opportunities for investment, as well as the rights, privileges, and concessions that it may be prepared to offer to responsible and satisfactorily equipped exploration companies. As a result of competition in the base metal markets, individual mining companies will attempt to protect their position by ensuring that most of their production facilities operate at a very low cost. Therefore, governments anxious to attract the mining industry should approach the problem with an attitude of willing co-operation. When this attitude becomes known within the industry, both at home and abroad, it will be a strong attraction to mining companies.

NO DUTY ON CEYLON GRAPHITE

The Minister of Finance, Mr. Stanley De Zoysa, has informed the Ceylon Chamber of Commerce that its request for a reduction in the export duty on graphite cannot be granted. The Chamber has, therefore, written to the Minister of Commerce and Trade, Mr. R. G. Senanayake, requesting him to impress upon the Minister of Finance that the entire graphite industry in Ceylon will be ruined if immediate relief is not granted.

According to the Chamber the two or three large graphite mines still operating on a restricted basis will be compelled to close down in the near future or cut production still further, since their output is unsaleable. This will lead to a further increase in unemployment and other grave problems. The Chamber points out that exports of Ceylon graphite to the U.S. have been steadily deteriorating during the past three years, and this year there has been a very marked decline. On the other hand, imports to the U.S. from West Germany and Madagascar are being more or less maintained, while imports from Hong Kong are increasing and are becoming a serious competitor to the Ceylon product.

The Chamber maintains that price is the all-important consideration, and that Ceylon is unable to reduce its prices and compete successfully with an export duty as high as Rs.50 per ton. It is further pointed out that the Australian market is practically lost, for Australia is purchasing the bulk of her graphite requirements at prices lower than those of Ceylon, and it is stated that the entire trade may ultimately be replaced by acetylene black. In regard to the lower and medium grades of graphite, the Chamber alleges that Australia is able to purchase her requirements from East Africa at much cheaper prices.

Emphasizing that unless Ceylon's graphite producers can be placed in a position to compete successfully with suppliers in other countries they will never be able to regain a foothold in the world market, the Chamber has urged Mr. Senanayake to take up this matter at Cabinet level and press for the waiving of the entire export duty, which is described as crippling.

Meanwhile, it has been announced that the Minister will shortly appoint a Graphite Advisory Board with the Director of Commerce as chairman.

NEW OUTLETS FOR CANADIAN COAL

The giant Dominion Steel and Coal Corporation of Canada, in an attempt to put the Nova Scotia coal industry on its feet again, has of recent months been making a determined bid for new markets. Due in part to massive coal imports from the United States, the Canadian coal industry has for years had a fairly lean time. Dosco is making a determined effort to prise away at least part of the United States market by concentrating on her chief Canadian customer—Ontario's industry. Ontario is Canada's biggest coal user, but almost all of the 18,000,000 tons annually supplied to industry is currently imported from over the border.

Markets for Nova Scotia's coal have dwindled since the war, and it will only be by selling coal to Ontario that the livelihood of the 11,000 miners in this province can be assured. In recent months Dosco has sold coal valued at \$5,000,000 to industrial users in Ontario, but if the economy of the industry is to be put on a firm footing, markets must be found for an additional 2,000,000 tons of coal a year, representing some \$20,000,000.

AUTOMATIC WINDER CONTROL—I.

Automatic Control of Mine Winders

WITH the increasing demand on the output of mines, which has been a feature of post-war years, and the rapidly growing use of machinery and modern means of transportation underground, attention has also been paid to the improvement of the equipment used to raise the products of the mines, particularly coal, to the surface. Progress has been made in the construction of larger winders with greater capacities, and, at the same time, in improving the control of Ward-Leonard electric winder drives to give optimum performance, minimum of wear, and maximum reliability. Among the outstanding achievements in this direction has been the Rapid-Exact system of control developed by Brown Boveri and its adaptation to completely automatic operation.

Thanks to the progress achieved in this field, automatic installations can now be used which are capable of raising up to 25 tons at speeds of 16 to 20 m. (50 to 65 ft.) per sec., which, for such machines, represents a power of about 5,000 kW. By accurately timed winding schedules and by taking full advantage of plant capacity, up to 850 tons per hour can be raised, or up to 240 miners carried up and down during shift changes. Since, to turn round the cages in the shortest possible time, masses corresponding to 150 tons have to be accelerated smoothly, then retarded, and finally accurately brought to rest, regardless of effective load and direction of travel, the control, regulating, and supervisory equipment of winders operate under extremely severe conditions. This is accentuated by the fact that the loss of one second per trip may represent a loss in production of about 1 per cent.

In their trips from surface to pit bottom and vice versa, or from one level to another, the multi-tier cages or skips follow a very definite schedule and can be automatically or semi-automatically controlled. In addition, the winder

can run at reduced speed in accordance with a particular schedule, using simple, unregulated manual controls.

Although Brown Boveri had, for some time, been making supplementary devices to improve straightforward manual control, their first attempt at combining a regulating system with a winder drive was made in 1948. This has been developed as the Rapid-Exact control and provides accurate maintenance of the optimum winding schedule, permanent supervision of the admissible speed, and automatic supervision of the most important control elements.

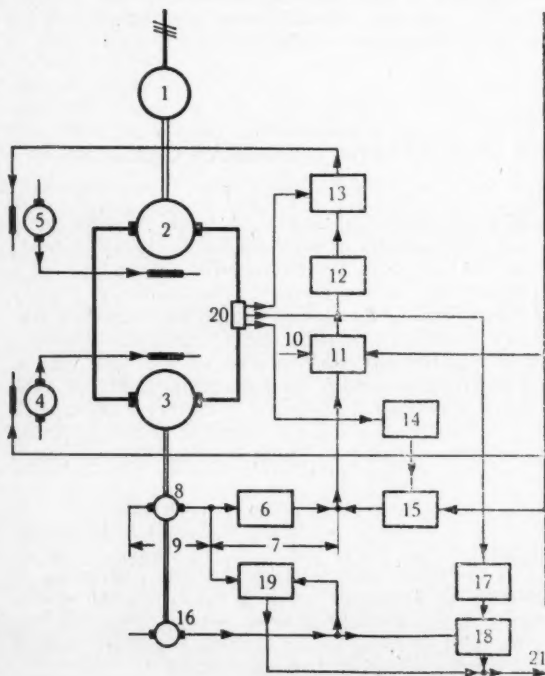
Rapid-Exact Control

By Rapid-Exact control, acceleration, running at speed and retardation can be carried out in accordance with a set programme, but the operator must give "start" and "stop" orders. The regulator is continuously supplied with the difference between the prescribed "desired value" and the actual value maintained by the machine. The regulator output then appropriately influences the source of supply of the winder motor. By the combined action of the regulating system and the desired value, which varies during the retardation period according to the load, the schedule is adhered to in such a way that acceleration and retardation remain within the limits of rope slip admissible for Koepe winders.

A current-limiting regulator included in the system prevents the starting current, and with it the torque, from exceeding a certain limit, thus reducing the strain on the machine and rope. It is also possible, by using a power-limiting regulator, to protect a relatively weak supply system against overloading. The reference potentiometer and the regulating equipment together ensure that the optimum winding schedule is adhered to regardless of the manner in which the operator performs his duties.

The speed of the machine is supervised throughout the entire wind, and there is continuous supervision of the retardation period in relation to the load. Since a breakdown of the actual value generator, which is a tachogenerator, would render the operation of the entire control system ineffectual and could prove dangerous for the machine, its voltage is continuously compared with that of a second or supervisory generator by means of a sensitive differential relay which would trip and apply the safety brake should a defect occur in either generator.

This regulated manual control system, however, still did not provide fully automatic operation, and further development was sought which, by carrying out the simple actions of the operator, would enhance reliability further by eliminating faulty manipulation and would improve efficiency by speeding up the winding process. To achieve this involved the automatic correction of all irregularities likely



Schematic diagram showing Rapid-Exact control of a d.c. winder: 1, Converter motor; 2, Ward-Leonard generator; 3, Winder motor; 4, 5, Exciters; 6, Control resistor; 7, Desired value; 8, Control Tacho-generator; 9, Actual value; 10, Introduction of further quantities; 11, Magnetic amplifier; 12, Astatic regulator; 13, Static current regulator; 14, Retardation regulator; 15, Electric retarding device; 16, Supervisory Tacho-generator; 17, Supervisory regulator; 18, Supervisory device; 19, Differential relay; 20, Shunt; 21, To emergency circuit

The converter sets at the Austrian ironstone quarry. In foreground is the converter for the Ward-Leonard drive while to the rear is the exciter converter

to affect adversely the winding schedule or rendering them harmless by the timely application of the safety brake.

In developing automatic control, the Rapid-Exact system was taken over exactly as it stood except for large cage winders, whose circuits had to be slightly modified to comply with the strict requirements for speedy and accurate decking.

The Winder Controller

Regarded as the most important element in this automatic development is the winder controller, which, with its electric retardation system, provides the reference value for the control system and is thus primarily responsible for the correct execution of the winding schedule. Its position must correspond reasonably accurately to the position of the cage in the shaft, or else the winding schedule cannot be adhered to correctly. Deviations, mainly due to the rope wandering on the pulley, must therefore be counteracted in good time, and this is carried out by an electrical adjusting system consisting of a planetary gear driven by a stop motor. If, on completion of a wind, the controller has run too far, it is brought back to its correct position.

Should the rope slip, the cage might gain a considerable lead on the controller, and since the control of the machine, as well as the supervision of its speed, is within the sphere of responsibility of the controller, such a lead might result in dangerous overshooting by the cage. To prevent this, a system was devised to check the position of the controller with that of the cage after each trip and, if necessary, to apply the brake before any harm is done.

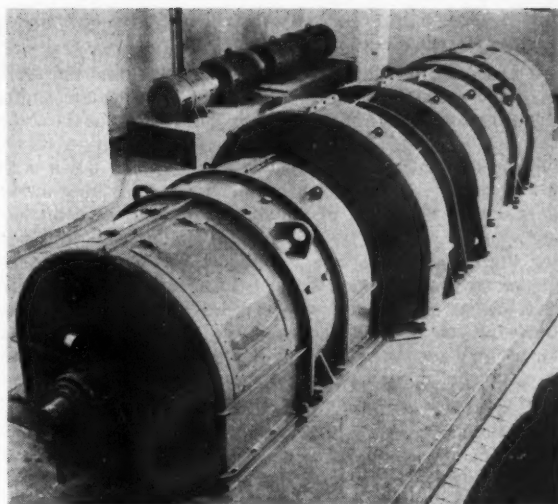
More dangerous still would be a breakdown of the controller drive, since this might result in the winder getting out of control, but this hazard is removed by the comparison of the voltages of the tachogenerators as already mentioned. The control tachogenerator is fitted to the pulley axle, while that supervising the speed is coupled in after the controller, and any irregularity in the drive of the latter would affect the voltage comparison and cause the safety brake to be applied.

To effect a saving in time compared with manual control, Brown Boveri arranged for the speed of the machine, as the cage approached its destination, to deviate only slightly from a fixed, fairly low crawling value. At the same time, the braking force was to rise very rapidly to full value when the "stop" order was given. To eliminate lost time and to prevent the brakes from being applied too sharply, a slight initial braking pressure was to be exerted

By **JOHN GRINDROD**

before the cage reached its destination, the brake-blocks being made to rest lightly on the rim of the pulley. In this connection, the new all-pneumatic braking control developed by the company, which includes a rapid response pressure regulator and functions without any linkages, is very useful.

The first pit winders to be equipped by Brown Boveri with automatic control were two Ward-Leonard cage winders, single and double deck respectively, at the Puits



Charles and Puits de Sagnat, near St. Etienne, France. Here, Rapid-Exact control was employed without assistance from magnetic amplifiers.

First in the range of skip winders to be so controlled was a single-rope counterweighted Ward-Leonard winder capable of lifting 21 tons at an Austrian iron mine. Iron ore mined in Styria, Austria, is obtained almost exclusively by quarrying. The rock is blasted from terraces in the mountainside and the ore conveyed down into the valley for sorting. Waste rock has to be dumped on a tip about two-thirds of the way up the other side of the mountain, and, to convey this, a horizontal tunnel has been cut into the mountain from the sorting plant.

At the end of this tunnel, the material is lifted up a vertical shaft, which comes to the surface close to the tip, and the two machines which perform the task of lifting the stone up the shaft are installed in a winder-house beside the shaft.

Partial Power Factor Correction

The converter for the Ward-Leonard drive of the main winder comprises two d.c. generators driven by a synchronous motor rated at 2,100 kW. at a leading power factor of 0.8 and 1,000 r.p.m. The motor is designed to provide partial power factor correction and for this is equipped with an automatic power factor regulating device. The set is run up asynchronously at reduced voltage from a starting transformer and after synchronization is connected to the 3 kV. mains. A control switch in the machine room starts this process, which is completed automatically.

Each rated at 1,200 kW. 335 v., and connected in series, the two d.c. generators feed the winder motor, which is rated at 2,100 kW. at 35.6 r.p.m. A second set, driven by an induction motor, supplies the excitation current for the synchronous motor, the constant voltage for exciting the motor field and for the d.c. controls. It also supplies the excitation current for the two Ward-Leonard generators.

To the right hand of the control desk in the machine room of this Austrian ironstone quarry is the control stand operated by a single lever which controls the winder motor and service brake simultaneously. To the left are the switch for selecting the manner of operation and telephones to enable the operator to communicate with the loading and unloading points. The front part of the desk

houses elements of the shaft signalling system and meters for the electrical equipment.

Graduated to represent the depth of the shaft, the depth indicator has two spindles driven via intermediate shafts from the main shaft of the winder. They rotate at the same speed in opposite directions, and the running nuts, carrying the pointers of the indicator, move up and down with the skip and counterweight respectively. In addition to indicating the location of the skip in the shaft and operating various auxiliary switches, they also actuate the gear for supervising the speed and regulating it in relation to the position of the skip and its load. The markings on the winder rope enable the operator to level the skip accurately and supplement the rough indication of the pointer. The supervisory devices which apply the emergency brake to stop the skip are coupled to lamps in the telegraph, where the cause of a stoppage is indicated as soon as it occurs.

A feature of this winder is that it can be operated in three different ways, and these can be set by means of the selector switch on the left of the control desk. For automatic operation, the order to start and stop is given by

pushing a button at the loading or unloading end. The Rapid-Exact regulating system enables the machine to accelerate in the desired manner and to be slowed down at the end of the run according to position and weight. The order to stop is given by a switch in the shaft actuated by the skip itself. There is no operator at the control desk.

Under controlled operation, the machine is controlled by an operator. Here, too, the Rapid-Exact system allows of optimum utilization of the drive with ease of control.

For emergency operation, the entire regulating system is cut out and the winder runs at reduced speed, controlled by an operator.

This winder has been operating satisfactorily in two- and three-shift service since it was commissioned in 1956. The automatic control ensures that the approach speed is uniform, so that a minimum of strain is exerted on the catches of the skips. It also copes with the enormous changes in load experienced when emptying and filling the skips.

(To be continued)

Finland's Mining and Metal Industries

ACCORDING to a recent Press announcement, the Finnish stockpiling programme will include the following commodities: aluminium, lead, nickel, tin, various alloys, steel billets, cotton, and mineral and liquid fuels. The Press announcement also stated that the Cabinet had determined the quantity of the various stockpile commodities that would be purchased from the U.S.S.R. with funds to be borrowed from the Bank of Finland. The total cost of these items is estimated at 4,700,000,000 Fmk., to which an additional 1,000,000,000 Fmk. may be added for transportation, duty, and storage expenses. Solid fuels and metals are not expected to present storage problems or expenses.

Some recent developments in Finland's mining industry are reviewed in the November issue of *Mineral Trade Notes*, the monthly inventory of information from U.S. Government foreign service offices. It is noted that in 1957 the 63,212 tonnes of lead-copper-zinc ore produced at the Metsämonttu mine contained 1.17 per cent lead, 1.80 per cent zinc, and 0.32 per cent copper.

Total output of lead concentrate in 1957 was 4,489 tonnes, of which 965 tonnes was from the Metsämonttu mine (50 per cent lead) and 3,524 tonnes from the Vihanti mine (53.83 per cent lead).

Output of zinc ore from Metsämonttu and Vihanti during 1957 totalled 455,726 tonnes, Metsämonttu furnishing 52,856 tonnes (4.24 per cent zinc and 15.57 per cent sulphur), and Vihanti 402,870 tonnes (10.68 per cent zinc, 0.65 per cent copper, and 0.66 per cent lead). Concentration of ore resulted in an output of 80,859 tonnes of zinc concentrate, of which 5,663 tonnes was from Metsämonttu (49 per cent zinc) and 75,196 tonnes from Vihanti.

Owing to depletion of the ore deposits, the State-owned Outokumpu company suspended operations in June, 1958, at the Aijala and Metsämonttu mines, pending results of further exploration. Extraction of zinc had been discontinued at Metsämonttu in July, 1957.

Borings were made by Outokumpu during 1957 and are being continued during the current year in the exploration of a deposit at Korsnäs, which is reported to contain more than 700,000 tonnes of lead ore.

Finland's production of iron ore and magnetite concentrate in 1957 totalled 802,000 and 209,783 tonnes each.

It is estimated that the Vuoksenniska Oy iron ore deposits at Nyhamn (in the Åland Islands) and Jussarö contain about 220,000,000 to 225,000,000 tonnes of ore. Company officials believe that, beginning in 1960, about 200,000 tonnes of ore can be mined annually from these deposits.

Mining rights to a small but high-grade iron ore deposit at Kärvasvaara, in the district of Kemijärvi, have been acquired by Otanmäki, and plans have been made to begin mining operations in mid-1959. Annual production of 20,000 to 40,000 tonnes of magnetite concentrate is anticipated. Phosphorus in the ore is reported to be negligible.

A preliminary investigation of an iron ore deposit at Kalari, in Western Lapland near the Swedish border, by the State-owned prospecting company, Suomen Malmi Oy, indicates about 10,000,000 tonnes combined of haematite and magnetite ores, averaging 30 to 40 per cent iron. The Otanmäki and Outokumpu companies are reported to be interested in mining the deposit.

It is still uncertain whether the iron and steel works proposed by Otanmäki in northern Finland will be approved.

Among the many reports of discoveries of uranium ore during 1957 in Finland, only three seem significant. A deposit at Eno being explored by Atomenergia Oy appears to be the most promising, and discussions reportedly are being held on the possibility of selling the ore to a Swedish company. The other two deposits are at Askola and Perno, and survey work was begun by the State-owned power company, Imatran Voima Oy, and by a newly established mining company, Ab Perno Oy.

The vanadium plant of Otanmäki, which began operating in 1956 in Finland, installed additional equipment early in 1958 which will increase vanadium pentoxide production to between 900 and 1,000 tons per year. In 1957, 469 tons of vanadium pentoxide was produced from the treatment of 88,000 tons of iron concentrate. In the separation process, 66,500 tons of iron pellets containing 64.93 per cent Fe, 2.85 per cent TiO_2 , 0.23 per cent V, and 0.09 per cent S, were also obtained.

The Canadian Mining Industry in 1958

CANADA'S mineral industry faced a real challenge in 1958, writes The Hon. Paul Comtois, Minister of Mines and Technical Surveys, Ottawa, in a comprehensive survey. Despite the current recession with resulting lower metal prices and slackening in demand for metals and minerals, it has continued, in the overall picture, to show growth and achievement, albeit at a much lower rate than in previous years of post-war growth.

Indeed, there is a good possibility that in 1958 the industry may have chalked up another record in value of output. Latest indications show that the gains and losses recorded should balance out to a gain of from 1-2 per cent in overall value of production; i.e., that the substantial losses recorded in iron ore, crude petroleum and asbestos, in particular, will have been more than offset by the great jump in the value of uranium production and the smaller gains made by natural gas, silver, zinc and gold. The Minister considers that this could mean a mineral output for 1958 valued at some \$2,175,000,000.

A factor of great importance to the country's mineral economy in 1958 has been the industry's attitude in the face of the current world oversupply of metals—its refusal to take a short-term view of the situation and to be influenced and hedged in its planning for future growth by the necessity for temporary cutbacks in production.

Rather, by the continued development of such major projects as Moak Lake in northern Manitoba (Inco's nickel development) and at Mount Wright in Quebec (Quebec Cartier Mining Co.'s mammoth iron ore project), as well as by continued large expenditures on exploration in the more promising areas such as Mattagami, it is looking beyond the present imbalance of supply and demand to the eventual strengthening of the mineral markets.

This refusal to be clouded in its outlook by near-term uncertainties is bound to pay dividends in more ways than one, states the Minister, when the trend in industrial activity once again swings upwards.

There has, however, been a slowing down in the tempo of exploratory activity as companies have had to take stock of their programmes and trim here and redirect there.

The biggest exploration news of the year came from the 2,000 sq. mile Mattagami region of western Quebec, one of the most promising prospecting areas to come to light in recent years. Dozens of companies are active in the region and a number of interesting finds have been made, including those of New Hosco Mines, Orchan, and Kennco Explorations (Canada) Ltd. The area attracted attention a year ago with the discovery there of a major zinc-copper-gold-silver orebody by the Mattagami Syndicate.

Production and Markets

In a year of ups and downs, the development of Canada's energy resources probably attracted widest attention: uranium and natural gas because they are thriving new industries with broad horizons, and crude petroleum, Canada's number one mineral in point of value for the past five years, because of its all-out struggle for markets in the face of world oversupply and a greatly reduced demand.

Top billing in 1958 went to the country's \$400,000,000 uranium industry. Canadian production for the year is expected to rise to 14,000 tons. By 1959, the output value will probably exceed \$350,000,000, averaging out at this rate until the contracts with the U.S. and U.K. expire.

The progress of the Canadian mining industry in 1958 is surveyed in the Annual Review number of *The Northern Miner*, which, as always, contains authoritative articles covering all aspects of exploration, production and exports against the background of a world context.

In the base metal field, nickel markets were so soft last year that International Nickel cut-back production from its 1957 output of 145,000 s.tons of nickel and 140,500 s.tons of copper to 100,000 s.tons of nickel and 100,000 s.tons of copper. At Falconbridge Nickel Mines, however, production in the first half of 1958 was slightly higher than during the last half of 1957, and Sherritt Gordon mines in northern Manitoba continued the expansion of its mine and plant capacity. Despite the depressed nickel market, Inco is going ahead with the full-scale development of its Manitoba project into the world's second largest source of nickel.

Canada is an important factor in the Free World copper market, being fourth largest producer. In 1957 output was 360,745 s.tons, an all-time record. For the first eight months of last year domestic output was 256,879 s.tons compared with 224,293 s.tons in the corresponding period of 1957. Geco Mines and Gaspé Copper Mines were the prime reasons for last year's higher output. Geco reached production late in 1957; it averaged better than 3,500 t.p.d. last year. Gaspé was hampered for much of 1957 by a strike.

The higher pace for the first eight months of last year cannot have been maintained. The production cuts at Inco started to show their effects around late summer; subsequently, operations were closed by the strike. Furthermore, several companies suspended production. Activity has picked up in the Chibougamau area, however, because of the improved copper prices in the latter part of 1958.

Fears that the U.S. would raise barriers against imports of Canadian and other foreign lead and zinc were realized in September, when the Administration imposed quotas on these metals.

Canada's largest lead and zinc producer, Consolidated Mining and Smelting Co. of Canada, decreased its output of refined lead by 20 per cent in mid-year. While mine closures and production curtailments resulted in reduced production from Quebec and Yukon, Ontario's output rose because of the increase in output from the two new producers, Geco Mines and Willroy Mines in the Manitowadge area.

Canada's exports of refined lead decreased 25 per cent and of refined zinc 16 per cent during the first half of 1958, compared with 1957. Exports of lead and zinc in concentrates, however, increased by 17 and 39 per cent respectively. The increase came from the Geco and Willroy mines, both of which ship to smelters in the U.S.

Iron ore production declined markedly in 1958, mainly because of the low operating rate of steel mills in the U.S., which absorb the bulk of Canada's iron ore exports. The Dominion's output last year was expected to amount to 16,000,000 - 17,000,000 l.tons, compared with 20,000,000 l.tons in 1957.

Nowhere is the mineral industry's faith in the future better exemplified than among the producers of iron ore. Its basis, of course, is Canada's tremendous iron ore potential, which is particularly high in the province of Quebec.

Looking beyond the temporary decline in American and Canadian steel consumption, the iron ore industry is spending millions on exploration and development.

Gold edged upward in volume of production during the year. The main increase came from Ontario, the principal producer, whose 30 mines accounted for 60 per cent of the output during the first five months of 1958. Interest in gold rose considerably and increased attention was given to the Red Lake camp in north-western Ontario, and to properties in North-West Territories and in Beauce Township in the Eastern Townships of Quebec. To assist the industry further in offsetting the fixed price for gold and higher production costs, the Canadian Government increased and extended cost-aid payments to gold mines under the Emergency Gold Mining Assistance Act. The amendment increased cost-aid assistance by 25 per cent and extended the assistance payable to cover the period 1958, 1959 and 1960.

The same pattern of temporary production cutbacks on the one hand and of planning and preparing for future growth on the other, is evident among the other metals. Canada's only source of tungsten, for instance, the mine of Canadian Exploration Ltd., near Salmo, British Columbia, ceased operations in mid-year with the expiration of the company's contract with G.S.A. The deposits still contain mineable tungsten.

In western Quebec, Molybdenite Corporation of Canada, a molybdenum and bismuth producer, announced plans to make moly-based lubricants and to improve its methods of recovering beryl as a by-product of its operations.

Because the rapid growth in Canada's production of industrial minerals has been tied in so closely to the great growth of the country's economy, it is expected that weaknesses in the industrial economy will result in lessened demand for minerals of this group. Structural materials proved to be the exception in 1958, owing to the continued high rate of construction activity. An overall increase of from 3 to 5 per cent in value over the \$275,000,000 production of 1957 is expected.

Sales of Canadian asbestos in world markets fell off markedly during the year, partly because of the increase in sales of Russian asbestos in Western Europe. Despite this, three new asbestos mills were brought into production in the Eastern Townships of Quebec, bringing the broad expansion programme, inaugurated in 1950, to near completion.

A promising potash industry is taking shape in Western Canada, where large deposits of potash occur.

The Outlook

Looking ahead, *The Northern Miner* predicts that 1959 will be an excellent year for almost all of mining. All signs visible in the final quarter of 1958 pointed in that direction. The North American recession, which brought plenty of troubles for producers in the last six months of 1957 and the first half of 1958, is on the wane; in fact, major indicators such as steel production and carloadings show an upward trend. With further increase certain for uranium, with iron ore demand rising, and with base metal prices up from this year's averages, it is probable that 1959 will see mineral output set another all-time record.

The longer range outlook, too, is encouraging, for mining continues to grow and expand. There is no question that Canada can continue to find and produce increasing amounts of mineral wealth. The principal problems to be encountered will be those of marketing, for competition from lower-cost countries will probably be intensified in the coming years. New economies and operating efficiencies for many mineral products will be needed to meet that competition.

Facts about Cobalt

The information contained in this article is extracted from the first volume of "Cobalt", a new quarterly review issued by the Centre d'Information du Cobalt, S.A., from whom it is obtainable free of charge. The C.I.C. is the executive organization of the Cobalt Development Institute formed in 1957 by the world's leading cobalt producers. Its offices are at 35 Rue des Colonies, Brussels; a branch office for the American continent is located in Columbus, Ohio.

SOME years ago in Egypt, archaeologists discovered blue glass statuettes in tombs undisturbed for over 4,000 years. Spectrographic analysis of these objects showed that a cobalt-based colouring agent was used by the ancient Egyptians.

Around 1520, in Saxony, a blue pigment was produced from complex arsenical silver-cobalt-nickel-bismuth ores. On smelting, these ores gave a speiss, metallic in appearance but brittle and of no practical use. The miners of that time, unable to refine this material, saw therein the workings of "Kobold", the German word for goblin.

The manufacture of cobalt blue continued in Saxony until 1880, when cobalt-bearing deposits were discovered in New Caledonia. Meanwhile, Brandt had separated the metal. Bergman, in 1790, proved cobalt to be a chemical element.

The discovery of the large silver-nickel-cobalt ore deposits in Canada in 1905 led to the closing down of production in New Caledonia. At this time metallic cobalt still had no applications. The metal was first used in 1910, since it was then found that cobalt additions improved considerably the properties of high-speed steels. Subsequently, applications of metallic cobalt have been developed in many other fields and have greatly exceeded the uses of cobalt compounds, while the discovery of new ore-bodies has ensured supplies to the consuming industries.

Since the mining of Canadian ores began, cobalt has appeared on the world market from the Belgian Congo (1924), Morocco (1930), Rhodesia (1933), Finland (1939), and the U.S.A. World production rose from 3,800 tonnes in 1937 to 14,600 tonnes in 1957.

The greater part of present-day production comes from complex cobalt-copper and cobalt-nickel ores. The metal content of the deposits varies within wide limits, so that cobalt production can readily be adapted to consumption fluctuation by a judicious choice of the ores to be treated.

The opening of new mines and refineries, together with future expansion of existing plants, will lead to a 7,000-ton increase in annual production capacity within a few years.

The known cobalt reserves are sufficient to ensure supply, at the present rate of consumption, for at least 80 years.

The first issue of *Cobalt* contains an article on the uses of cobalt metal, which are discussed under the headings of heat-resisting alloys, permanent magnet alloys, tool and wear-resisting alloys, and miscellaneous alloys. It is concluded that a deeper knowledge of the properties of cobalt-base materials could lead to a much wider use of the metal. Moreover, though cobalt already has many applications, its role is still not clearly defined and the lack of theoretical data concerning its behaviour often hinders the development of other uses.

The present outlook of the market makes it possible to consider new uses of cobalt without fear of short supply. The C.I.C. has accordingly entrusted various specialized laboratories with the execution of a vast programme of fundamental and technological research. The results of these investigations will be made available in the quarterly review and in other technical publications.

MINING MISCELLANY

An agreement has been completed between the Province of Saskatchewan, Canada, and a Toronto mining interest. W. S. Kennedy Grubstake, 1958, giving the Kennedy interests rights to explore for minerals in the remote Saskatchewan northlands.

The Chinese Coal Ministry in Peking has claimed that China last year doubled its coal output to produce 270,200,000 tons, thus passing Britain's output for the year and becoming the world's third largest producer.

Production of magnesium metal will begin in Hungary during the first half of the current year. Raw material will be locally mined dolomite. By 1960, it is expected that output will have expanded sufficiently to cover all the country's requirements for this metal.

Cleveland-Cliffs Iron Co. has joined Ford Motor Co. in a multi-million dollar programme to expand their facilities for mining and concentrating iron ores in Michigan's Upper Peninsula. Production capacity of Humboldt Mining Co., located near Marquette, U.S., and owned equally by Cliffs and Ford, will be doubled.

A four-man team of Yugoslav mining engineers will visit United Kingdom collieries and manufacturers of modern equipment this month under the auspices of the British Council. The visit is connected with Yugoslavia's plan for a 40 per cent increase in coal production by 1961. The National Coal Board has planned a three-month tour from centres all over Britain. More than thirty pits and sixteen factories, research units, and rescue centres are on the programme.

The National Coal Board has cut its price of house coal delivered in Ireland by 25s. a ton in order to compete with the growing imports of United States coal in the Irish market. The reduction is said to bring the price down to the United Kingdom inland price. But Dublin coal merchants say a greater reduction is necessary, since even after the proposed cut United Kingdom coal will still be 15s. a ton dearer than United States coal.

On December 28, the Kelantan (Federation of Malaya) Council of State passed a resolution approving an investment of State funds in the Oriental Mining Co., which is operating an iron-ore mine at Temangan. The company was formed with British and Japanese capital, and the State will invest new capital to the amount of \$M97,890. The State Financial Officer, in proposing the investment, said that it would accord with the government's policy of welcoming foreign capital. A councillor urged that the government should protect its investment by appointing directors to sit on the board. Another councillor called on the government to make arrangements which would permit of its shares being sold after some years to afford an opportunity to the people to play a bigger role in the economy of the State. In his Speech from the Throne at the opening of the meeting, the Sultan, referring to

the new policy of encouraging foreign investment, said that he hoped that mining companies would honour the stipulation that Malays should be employed in the mines.

Deposits of coal at Attarnikerdluk, in Western Greenland, are now said to contain at least 35,000,000 tons of coal having a calorific value of 5,000 per kilo, which compares with 7,000 per kilo for good-quality British coal.

A preliminary report has been made by Lloyd M. Schofield, consulting geologist, on the main Iron Mountain deposit of Great Whale Iron Mines in Northern Quebec, Canada. The deposit, it is stated, has a potential of 600,000,000 tons of about 38 per cent iron content available for open-pit mining. Work at Great Whale is being financed equally by Belcher Mining, Wright-Hargreaves, and Malartic Goldfields. An economic survey of the area, conducted by Sir Alexander Gibb and Partners, indicates the situation is favourable for the establishment of large-scale production.

In Argentina, the Lower House recently approved an administrative Bill, passed earlier by the Senate, creating the Yacimientos Mineros de Agua de Dionisio (YMAD) for the exploration, exploitation, and commercialization of manganese-gold deposits at Farrallon Negro, Catamarca Province. YMAD must establish and begin operating a beneficiation plant, with a minimum daily productive capacity of 250 tons, within seven years. The National Government is to provide 20,000,000 pesos as capital for YMAD, and is authorized to extend 10-year-term, interest-free credits of up to 150,000,000 pesos.

In a report on nickel, the current bulletin of the U.S. National Association of Purchasing Agents states that the disturbance in Cuba has slowed down the Nicaro operation. The damage so far has been mainly to spare parts, and operations have been continuing intermittently.

The Norwegian aluminium industry had a record year in 1958, with a production of some 120,000 tonnes, compared with 96,000 tonnes in 1957, according to a report from A/S Norsk Aluminium. By 1965, Norway should reach an annual production of some 215,000 tonnes.

Commonwealth Aluminium (Proprietary) has been granted a special mineral lease of about 22 sq. miles in the Grove Peninsula, Northern Territory of Australia. This area is known to contain substantial tonnages of bauxite, but more testing work is required before the commercial importance of the deposits can be determined. Under the terms of its lease, the company undertakes to examine the area within two years and present a plan for development of the deposit and treatment of the ore within five years.

In the National Certificates and National Diploma in Mining examina-

tions, 328 candidates out of 719 were successful in obtaining the Ordinary National Certificate in Mining, Group 1 (Mining); 222 candidates out of 304 obtained Group 2 (Surveying); 119 candidates out of 234 obtained the Group 3 (Mining Mechanical); 172 candidates out of 320 gained the Group 4 (Mining Electrical), and 17 candidates out of 21 received the Endorsement. In the Higher National Certificate in Mining, 256 out of 348 candidates were successful, and in the Higher National Certificate in Mining Surveying, 145 candidates out of 197 were successful. Out of 215 candidates, 157 obtained the National Diploma in Mining.

PERSONAL

Mr. J. A. Maloney has been named Minister of Mines for the Province of Ontario, Canada. He succeeds the Hon. J. W. Spooner, who has headed the Mines Department since 1957.

Mr. G. B. Pearce has been appointed a director of Geevor Tin Mines in place of the late Mr. E. V. Pearce.

Mr. H. C. Tett, formerly a managing director and chief executive, has been appointed chairman and managing director of Esso Petroleum Co. Ltd.

Mr. J. M. Williams has been appointed an associate director of Hoiman Brothers Ltd. Mr. Williams has moved from the Camborne headquarters to take up the position of London director at 44 Brook Street, W.1. He is already a director of two of the company's subsidiaries, Climax Rock Drill and Engineering Ltd. and Maxam Power Ltd.

Mr. S. J. Wooldridge has been appointed a director of Metal Sales Co. Ltd., United Kingdom subsidiary of Kennecott Sales Corporation, New York.

Mr. S. Frisell has resigned from the boards of Swedish Iron Ore and Algerian Iron Ore on reaching normal retiring age. Mr. F. D. Duncan has resigned as a director of the companies because of ill health. The board of Swedish Iron Ore now consists of: Dr. J. W. Nordenson, chairman; Mr. U. G. T. Enegren, managing director; and Mr. A. G. H. von Heidenstam. The Algerian Iron Ore board now comprises: Mr. S. Brusewitz, chairman; Mr. von Heidenstam, managing director; Mr. Enegren, and Mr. C. Vassilliere.

CONTRACTS AND TENDERS

Yugoslavia

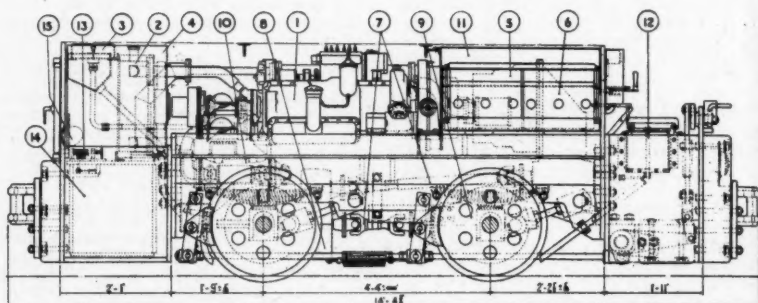
The import enterprise "Rudar" would like to receive tenders from United Kingdom firms for equipment for a pilot plant at Vreoci to demonstrate Fischer-Tropsch synthesis. United Kingdom firms interested should write direct to Mr. O. Pavlovic, "Rudar," Kolarceva 1/IV, P.O.B. 568, Belgrade, and send copies of their letters to the British Embassy, Belgrade. "Rudar's" reference 111-4/58 should be quoted. Ref. E.S.B. 31652/58 I.C.A. Telephone inquiries to Chancery 4411, extension 354.

Machinery and Equipment

75 b.h.p. "Miner" Locomotive Recently Introduced

Following the successful introduction of their 100 b.h.p. "Miner" locomotive in 1958, the North British Locomotive Company, Glasgow, has recently introduced a smaller but similar unit of 75 b.h.p. It will be recalled from the article in *The Mining Journal* of August 10, 1956, that the 100 b.h.p. locomotive is widely used not only in this country, but in Australia, the Rhodesias, and Canada, and has been developed to incorporate the builder's Voith-North British fully automatic hydraulic transmission.

The new smaller model also incorporates this transmission but in a simplified form, and is intended to be a supplementary unit to the larger locomotive, which has already found such wide application. The new locomotive also shows the low overall height combined with narrow width, giving excellent all-round visibility and extreme simplicity of control which characterize the 100 b.h.p. locomotive.



fluid is cooled in a section of the radiator.

Another interesting feature of the locomotive is the use of cardan shafts and bevel gears for the final drive to the wheels, instead of the more usual jack-shaft and side rods. This means that the

General arrangement of 75 h.p. "Mining" Locomotive with Voith-North British Hydraulic Transmission: 1, Diesel Engine; 2, Radiator; 3, Aux. Water Tank; 4, Water Tank; 5, Hydraulic Transmission; 6, Reversing; 7, Cardan Shafts; 8, Primary Axlehung Gearbox; 9, Secondary Axlehung Gearbox; 10, Transmission Oil Heat Exchanger; 11, Fuel Tank; 12, Sandbox; 13, Engine Stop Trip; 14, Exhaust Conditioner; 15, Headlight

COMPARISON OF THE LEADING DIMENSIONS OF THE TWO DESIGNS

	100 b.h.p.	75 b.h.p.
Length over buffer beams	15 ft. 1 in.	13 ft. 2 1/4 in.
Wheelbase	4 ft. 7 in.	4 ft. 4 in.
Wheel diameter	2 ft. 0 in.	2 ft. 0 in.
Maximum height	4 ft. 5 in.	4 ft. 5 in.
Maximum width	4 ft. 0 in.	3 ft. 11 1/2 in.
Total weight in working order	15 tons	10 tons
Tractive effort, 25 per cent adhesion	8,400 lb.	5,600 lb.
Minimum radius of curve	45 ft. 0 in.	45 ft. 0 in.
Fuel capacity	17 1/2 gallons	17 gallons
Maximum speed	12 1/2 m.p.h.	10 m.p.h.

One interesting feature is that a horizontal type of diesel engine is fitted. This provides an extremely compact unit with no space loss and ready accessibility to all parts for maintenance. The engine in question is the Leyland AU350/16 normally aspirated engine which develops 75 b.h.p. at 1,800 r.p.m. at n.t.p.

The transmission is a Voith/North British type R14 single-stage torque converter which is fully automatic in operation. It is mounted behind the engine and driven from it by a short shaft with two flexible couplings. The transmission

whole of the drive is taken by rotary motion, and an entirely uniform torque is applied to the wheels. The reversing gearbox is situated immediately behind the transmission and is bolted to it. It transfers the drive to a cardan shaft running forwards beneath the engine and transmission to a primary bevel gearbox on the front axle. A short shaft to a small secondary gearbox on the hind axle connects the wheels.

Braking is by a mechanical handbrake only, so that there is no necessity to fit an air compressor, although one can be

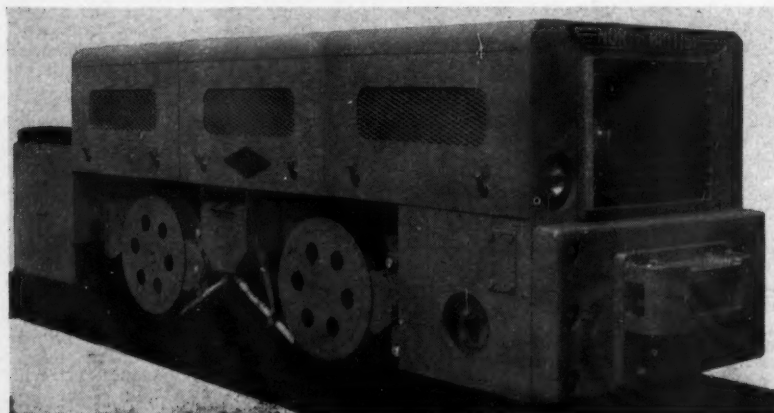
incorporated if required. The locomotive can be supplied, if necessary, fully flameproofed with the Berger "handraulic" starter, or alternatively, with electrical starting and without flameproofing for other applications.

In other applications where flameproofing is not required with electrical starting, an exhaust conditioner is fitted as standard on the front end in either case. The locomotive is designed so that the two ends of the frame are attached by fitted bolts and may be removed for installation purposes. This reduces the overall length to approximately 8 ft. The locomotive can be built for all gauges between 1 ft. 11 1/2 in. to 3 ft. 6 in.

FAST TUNNELLING AT AGECROFT

In the North-Western Division, No. 1 (Manchester) Area of the N.C.B., a new tunnelling record has been claimed at Agecroft Colliery. During the five days commencing 7 a.m. on Monday, November 24, 1958, to 7 a.m. the following Saturday, the Associated Tunnelling Co. Ltd., with the full co-operation of the National Coal Board, advanced a distance of 60 yds. in the Main North Cross Cut, No. 1 Horizon. The tunnel, driven through medium sandstone at a gradient of 1 in 350 to the rise, is supported by three-piece arches 16 ft. 6 in. wide by 13 ft. high, set at 3 ft. centres, and completely covered by precast concrete slabs placed in the web of the arches. The excavated size of approximately 18 ft. by 14 ft. gives a cross-sectional area of 220 sq. ft.

In achieving this result, the Associated Tunnelling Co. Ltd. drilled exclusively



The 75 b.h.p. "Miner" locomotive

with seven Atlas Copco rock drills, type BBD41WKB, mounted on Atlas pneumatic pushers, type BMK55s, having a feed length of 36 in. All the machines were in use for each drilling, five being used from floor level and two on a planking scaffold laid on horizontal girders clamped to the arches. An average of 51 holes was drilled per round, and 140 lb. of Polar Ajax explosive was used, with milli-second delay detonators for each firing.

Seven tunnellers were employed at the face during each eight-hour shift, the teams changing over at the face. A total of 105 man-shifts was worked during the five-day period plus supervision by the A.T.C. and supervision and shot-firing by the N.C.B. As the operational cycle was completed in four hours, an advance of 4 yds. per shift was obtained, loading of the broken rock being done by two Eimco 21 mine loaders filling into 62 cu. ft. capacity mine cars.

During the week the following figures were obtained, using a standard wedge-cut drilling pattern: average drilling time, 40 min. (approx. 335 ft. per round); charging and firing, 45 min.; mucking out, 85 min. (49 cu. yds. per round); and placing of arches, 70 min. A battery locomotive was used for hauling the mine cars, and a portable traverser, mounted on the prefabricated track, was used for tub switching. The tunnel in which the result was recorded is part of a large-scale development programme.

A TRACTOR-MOUNTED VOLE DRILL AND COMPRESSOR COMBINATION

A growing demand for deep-hole drilling rigs with the accent on mobility has resulted in a new task for the versatile tractor. To a Fordson Power Major tractor have been added a number of Holman Group products: a Climax Vole drill, a Holman air compressor, and Maxam pneumatic control equipment. This Vole drill combination has the important advantages of being self-contained and self-propelled, and it is ideal for operation on difficult and uneven ground, and can be manoeuvred over the roughest terrain. The unit can be got ready for operation in a matter of minutes, and it is easily worked by one man.

The Climax Vole drill embodies a "down the hole" drilling technique, the drill hammer being attached to the end of the feed tubes. A 3½ in. Vole drill, capable of drilling down to 150 ft., is mounted to the rear of the tractor on a fabricated channel and angled steel structure. Attached to this structure by means of a pivot is a rigid beam which carries at the top a 3 h.p. piston-type air hoist motor. A 3 h.p. rotation motor, also of piston type, is secured to a platform which runs in slides attached to the beam and to it are attached the feed tubes (10 ft. in length and 2½ in. dia.). As drilling progresses, the rotation motor descends in the slides until a new feed tube is required. To allow this to be fitted, the hoist motor is brought into use to raise the rotation motor on its platform.

At the base of the vertical member, the feed tube passes through an automatic centralizer/clamp. This centralizer/clamp, which is actuated by two Maxam air cylinders controlled by a hand-operated valve, serves to steady and guide the hammer when the hole is started and also facilitates adding or removing lengths of feed tube by clamping

between two square jaws the flats at the end of the feed tube.

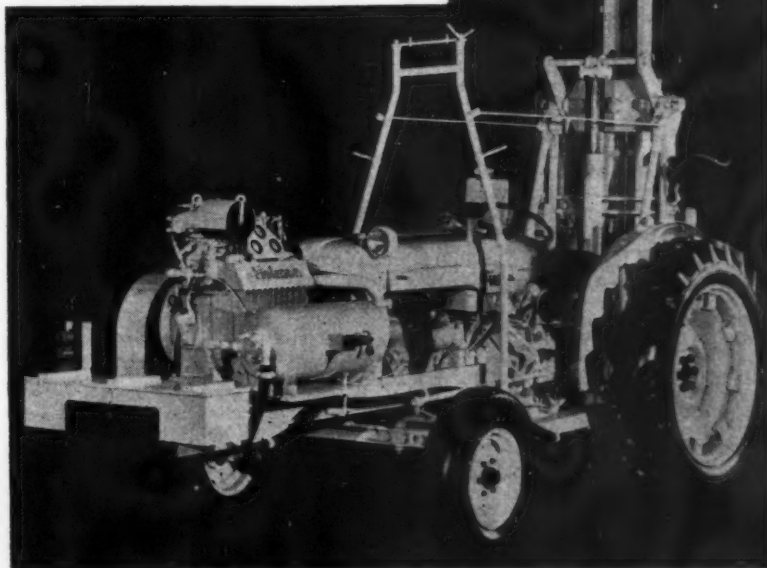
The hammer is of special long-stroke design and is attached to the end of the feed tube. As drilling progresses, the hammer passes into and down the hole and is thus always in immediate contact with the rock. No power is lost in transmission through the series of jointed rods and the drilling speed at depth is the same as it is on the surface.

The hole is kept clear of chippings and dust by a constant flow of live air which passes down through the feed tubes and emerges at the bottom of the hammer. This air also serves to cool the tungsten-carbide tipped bit. Exhaust air from the hammer passes upwards through inclined ports in the hammer cylinder sleeve, and also assists in the clearance of debris.

In soft rock, where the percussive action is not required, a rotary bit can be attached to the end of the feed tubes and air is passed through the latter to clear the hole of cuttings. The thrust exerted by the motor attached to the chain feed can be set and kept constant automatically at any desired value up to 1,000 lb.

All controls for raising and lowering the feed tubes, as well as the control of the rotation motor and the centralizer/clamp are situated on a conveniently placed panel operated by Maxam control valves. Simple adjustments can be made for drilling at angles of up to 30 deg. from the vertical by means of an adjustable jack screw attached to the pivot of the beam. The same screw gearing is used to lower the beam into a horizontal position for transport.

The new tractor-mounted Climax Vole Drill and Holman Compressor combination. This mobile rig, using a "down the hole" drilling technique, is capable of drilling down to 150 ft. Shown is the front-mounted Holman FM13 Compressor which delivers 125 c.f.m. to the Vole Drill and its controls. The beam is in the vertical position for drilling. When travelling the beam is lowered to the horizontal and supported by the tubular structure over the tractor engine



The overall height of the Vole drill combination with the beam in a vertical position is 17 ft. 6 in. The beam is lowered to the horizontal position for travelling and is clamped to a tubular steel structure mounted over the tractor engine in front of the driver. Four 10 ft. feed tubes are carried on the side of the tractor, plus one on the beam. The front-mounted Holman FM13 compressor, which delivers 125 c.f.m., is vee-belt driven from a modified tractor belt pulley attachment and supplies compressed air to the Vole drill.

SOUND RATINGS OF FANS AND BLOWERS

The aerodynamic outputs of all types of fans and blowers are defined by an authoritative test code. Unfortunately, however, this is not the case in respect of sound ratings.

In order to assemble this data and present it in a currently acceptable form. Keith Blackman Ltd. have found it necessary to devise their own method or test code for sound rating fan equipment. This ensures that comparisons can be made and a consistency in test methods maintained.

Metals and Minerals

Gold and Silver in 1958

The turnover of the London gold market may have been somewhat smaller in 1958, write Mocatta and Goldsmid Ltd. in their annual circular, but the status of London as an international gold market has steadily improved. The rehabilitation of sterling has proceeded steadily, and the United States dollar developed some intrinsic weakness which led to considerable and fairly continuous export of gold from that country, mainly to European Central Banks. From \$35.00 at the beginning of the year, the dollar price of gold rose to \$35.08 by the end of January, and rarely dropped below this level for the rest of the year. Central Bank buying of gold in London for the monthly E.P.U. settlements was consequently eliminated. In general, the policy of Central Banks has evidently been to convert any surplus dollar holdings promptly into gold, on the preferential terms available to them in New York.

Throughout the early months of the year gold was in short supply on the London market, the only regular source being new production. The sterling price rose slowly but regularly from around 249s. to around 250s. During the summer months it rose sharply towards 251s. and remained, almost without interruption, above 250s. from that time onwards. Supplies in London were scarce, but the demand was only spasmodic. By September, with an average turnover, the London price had settled within a narrower range between 250s. 1½d. and 250s. 9d., as against a dollar price of \$35.10 to \$35.12.

The highest dollar price for the year for gold, viz. \$35.14½, was touched on a few days in October, when there was a very heavy demand, attributable in part to the covering of positions taken with an eye to the proceedings in New Delhi. When this demand fell off, the price fell back to \$35.09½. At this price, Russian sales of gold, which had not been in evidence since the early part of the year, were readily absorbed. During the last week of the year the price fell further to \$35.07½.

Once again, state Mocatta and Goldsmid, the annual meetings of the International Monetary Fund and World Bank, this time in New Delhi, gave rise to a great deal of rumour and some speculation, based on the American recession and the outflow of gold from New York. Official declarations and denials have little effect in the face of what seems to many observers to be compelling circumstances. A fairly general belief that, sooner or later, the dollar price of gold will have to be raised has found expression in a variety of schemes proceeding from the assumption that, whereas the value of the U.S. dollar might fall, the price of gold will not.

Silver

In the early months of last year, the turnover in London was well above the corresponding averages for 1957, and some export demand was satisfied. But during the second quarter of the year very quiet conditions prevailed. The

London price remained substantially below the New York shipping parity, except for a period in February and March and again in October, when some silver was imported from New York.

In October, the London price reached 78½d., its highest point of the year. The essential demand had recovered appreciably and the export demand followed suit until the market was short of supplies. The price in London rose to the New York shipping parity, and the price in New York was advanced from 89½ c. on October 8 to 90½ c., the highest price of the year, where it remained from October 14 to 31. A relapse to 90½ c. brought in the Bank of Mexico once again, but silver was imported from the New York market in October and November. From the high point reached in London towards the end of October, the price fell away for the rest of the year, and at the end of December stood at 75½d.

Imports of silver from other sources than the dollar area have been at about the same rate as last year. Exports, on the other hand, have declined considerably because industrial demands for silver have been reduced by the general falling off of activity on the Continent since the American recession. The amount of newly produced silver coming on to the London market and the amounts made available by the authorities from demonetized coin have been about the same as in 1957. Considerable quantities of silver coin came to this country during the first nine months of the year from Aden, but this traffic has, since October, been diverted to Italy direct.

Mocatta and Goldsmid estimate that the turnover in the essential market, which now includes the official export scheme, will prove to have been slightly higher than last year at 13,500,000 oz. The world price of silver seems to depend, for the time being, on the action of the Bank of Mexico, without whose interventions on the New York market the United States price would probably have fallen well below 88½ c., and the London price would have followed.

U.S. MANGANESE MARKET

Traders in New York state that, although official floor prices on manganese ore have been announced in India, effective January 1, such minimums have been set in past years and have not always been adhered to.

Reports from New York indicate that manganese ores in India have been piling up so much that output of both high and low grade ore will be cut back further, production being halted entirely in some areas. Negotiations on the United States wheat/Indian ore barter deal have not been finally concluded, and it is thought that India might quit the bargaining table since she is able to secure adequate grain without such a deal.

It is understood that one American concern is preparing to supply stainless steel to India in return for minimum

38 per cent manganese ore for shipment to an American producer of ferro-manganese. The latter, in turn, would furnish ferro-chrome to the steel mill. Reports suggest that the deal involves 30,000 tons of ore.

The U.S. General Services Administration has announced that about 297,000 tons of United States Government-owned low-grade manganese ore has been purchased by Electro-Metallurgical Co., a division of the Union Carbide Corporation. The material had been purchased from Mexican producers during the Korean war, but had been declared surplus to the requirements of the United States stockpile. Under the terms of the sale agreement, Electro-Metallurgical would remove the ore over the next two years from where it is stored at El Paso, Texas.

ALUMINIUM AND ALUMINA

Aluminum Company of America has announced that initial operations at its newest and largest alumina plant, under construction here, have been scheduled to start February 1. When in full operation, the plant will have an annual capacity of 1,000,000 tons, and is so designed as to permit future doubling of capacity. Alcoa had announced that on December 22 the company would resume five days a week production at its works at Bauxite, Ark., after several months of three to four days a week operations. The new schedule will permit production to a daily rate of about 400 s.tons.

One of the eight potlines at the Alcoa smelting plant was shut down on December 31 because of a shortage of low-cost power. Lack of rain has reduced the Tennessee Valley Authority's hydro-electric power output, and Alcoa has been buying higher-priced power.

Anaconda has announced plans for more vigorous participation in the United States aluminium market. Two wholly owned subsidiaries, American Aluminium Co. and Cochran Foil Corporation, have been merged into another subsidiary, Anaconda Aluminium Co. Ltd., making it a single organization with assets of over \$140,000,000. Anaconda Aluminium will be an integrated firm embracing each phase of aluminium production.

Aluminium Ltd., of Canada, and Fabrique d'Emballages Métalliques S.A., of Fribourg, Switzerland, the leading maker of aluminium cans in Europe, are merging their common interests in the aluminium can market in Europe and overseas. The Swiss firm, known as "F.E.M.", operates three can-making plants, one each in Switzerland, France, and Holland. It is the only manufacturing concern in the world whose sole business is the manufacture and sale of aluminium cans. Aluminium Ltd., through associate companies in Norway, Germany, and Denmark, has actively developed the market for aluminium cans in these areas. Its research subsidiary, Aluminium Laboratories Ltd., has

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conducted a ten-year programme of technical investigation and pilot-plant production in most aspects of the manufacture, filling, and use of aluminium cans.

West Germany's two leading producers of aluminium have lowered the price for virgin aluminium to 216 marks from 223 marks per 100 kgm. from January 1. The companies are the Vereinigte Aluminium Werke and the Aluminium Huetten Rheinfelden, owned by the Swiss Aluminium Industrie Company.

U.S. TITANIUM PRICE CUT

Crucible Steel Co. of America is cutting prices of its titanium mill products on a basis that will reduce the overall price of some items by about 10 to 12 per cent, effective January 1. The action comes about two months after the most recent wave of price cuts. Crucible expects the new prices to stimulate the growing interest in titanium for many missile applications and to broaden the metal's use in jet engines and airframes for both military and commercial transport planes. These are markets which titanium was losing earlier in the year to stainless steel. The lower prices are also expected to broaden the applications of titanium in the growing civilian markets.

RECORD U.S. SULPHUR EXPORTS

United States producers, hit by a recession in domestic markets, were able to increase exports last year to near-record levels. In an annual review, Mr. Charles A. Wight, president of Freeport Sulphur, reported that an increase in United States consumption towards the end of the year was insufficient to bring the annual rate to that achieved in 1957. On the other hand, shipments abroad reached an estimated 1,575,000 s.tons—only 75,000 tons below the record total shipped in 1956.

Preliminary data indicated that total domestic consumption of sulphur was fractionally off from 1957, reflecting the lower output of such major consuming industries as paper, steel, petroleum refining, rubber and textiles. On the other hand, the relatively good year experienced by the fertilizer industry and segments of the chemicals industry helped to bolster the consumption figure.

Sulphur production was also down. Total output from all sources in the United States amounted to an estimated 6,200,000 l.tons, compared with 7,000,000 tons in 1957. The drop in production was the result not only of lower consumption, but also of increased imports and, more significantly, a cutback in stockpiling.

To meet more effectively the increased competition abroad, the four United States Frasch producers formed the Sulphur Export Corporation to sell their sulphur outside the North American continent.

The quoted price of sulphur in the United States has remained unchanged since the reduction of \$3 a ton effected late in 1957. Prices during 1958 were quoted at \$25 per l.ton f.o.b. port and \$23.50 f.o.b. mine.

The need for an increase in the price of elemental sulphur was stressed by Mr. F. G. Lewis, vice-president of Jefferson Lake Petrochemicals of Canada, in an address to the Canadian Institute of Mining and Metallurgy. Mr. Lewis pointed

out that world-wide consumption was rising at an ever-increasing rate. Due primarily to Western programmes of industrial expansion and to the rising pressures to produce the staple foodstuffs for millions of undernourished peoples, world demand was expected to exceed 24,000,000 tons by 1957. Comparing the anticipated growth in demand with pro-

jected production, Mr. Lewis asserts that output of sulphur in all forms will be hard pressed to meet world requirements. He maintains that, to encourage the systematic discovery and development of new sulphur reserves, and to ensure maximum recovery of sulphur from all sources, the price of sulphur requires to be higher than its present depressed level.

COPPER • TIN • LEAD • ZINC

(From Our London Metal Exchange Correspondent)

The firm undertone reported last week has continued and has now spread to the tin market as well. This trend has resulted in higher prices for all metals other than zinc, which has remained approximately unchanged over the week. The majority market opinion is that although the undertone will remain satisfactory, actual rises in price levels are unlikely to be appreciable.

ACTIVE COPPER MARKETS

The copper market has been active, and although stocks at the beginning of the week showed a reduction of 550 tons to total 5,271 tons the backwardation has not shown any signs of increasing, and this fact can be read as evidence of support for the forward quotation. With most works here and on the Continent still engaged in stocktaking there has been little industrial enquiry other than of a very routine nature, but it is expected that with the firmer market more actual business is likely to be placed during the rest of this month.

It is regretted that in last week's report the total copper to be disposed of by the Board of Trade was given as 26,000 tons and not 30,000 tons, which is the correct figure. It now appears that the disposal will take place in two parts as tenders have now been called for 7,250 tons for delivery over the five months commencing February, and it is to be assumed, therefore, that a further tender for a similar tonnage will be called for subsequently for deliveries July to November.

In America, the copper market on Comex is very active and is tending towards higher levels, whilst at the same time both producers and customs smelters report adequate business. Offerings of scrap have decreased recently and smelters have raised their buying price for No. 2 scrap to 23½ c. per lb. although it is reported that above this price has been paid for sizeable parcels. The present optimism in the U.S. has led to the Howe Sound Co. announcing that steps are being taken to reopen the Britannia copper mine in British Columbia which was closed at the beginning of 1958 in view of the low copper prices then ruling and pessimistic forecasts as to its future.

TIN'S FIRMER UNDERTONE

Consumer interest in tin has increased and this has brought about a very different undertone to the market, which has shown an appreciable rise over the last week. It is confidently expected that the previous high point of £767 per ton will be passed in the next few weeks. Official stocks showed a decline of 150 tons at the beginning of the week.

The effects of the International Tin Council's restriction scheme on exports are clearly shown from the December figures for shipment from Malaya, which totalled only 49½ tons from Singapore and 1,732½ tons from Penang. These figures were just under half the tonnages exported during the previous month which was, of course, in the middle of a control period.

The position in the United States appears to be better as consumption of tin during October increased by 9 per cent and visible stocks also showed a decrease during the month.

On Thursday morning the Eastern price was equivalent to £785½ per ton c.i.f. Europe.

RIISING CONSUMPTION OF LEAD-ZINC

Lead and zinc markets have again been relatively featureless although the backwardation in the latter market continues as anticipated. Details of imports into the U.S. for the first quota period show that in general all quotas were filled, and news is now awaited of the opening of the second quota commencing in January. It is not expected, however, that this will have any effect on the market, as all quotas other than those for major producing countries are liable to be filled immediately from stocks of metal already in bonded warehouses in the U.S.

Generally speaking, consumption of the two metals throughout the world appears to be increasing from the very low level reached in the middle of 1958. It is expected that this will have a steady influence on the market, although sufficient tonnages of metal appear to be available to keep prices from rising to any appreciable extent.

Closing prices are as follows:

	Dec. 31		Jan. 8	
	Buyers	Sellers	Buyers	Sellers
COPPER				
Cash	£220	£220½	£222½	£222½
Three months ..	£219½	£219½	£221½	£222
Settlement ..	£220½		£222½	
Week's turnover	10,825 tons		9,625 tons	
LEAD				
Current ½ month	£71½	£71½	£72½	£73
Three months ..	£72	£72½	£72½	£73
Week's turnover	6,275 tons		4,825 tons	
TIN				
Cash	£747	£749	£755	£756
Three months ..	£749½	£750½	£757	£757½
Settlement ..	£749		£756	
Week's turnover	980 tons		480 tons	
ZINC				
Current ½ month	£75½	£76	£75	£75½
Three months ..	£72½	£73	£72½	£72½
Week's turnover	8,925 tons		7,800 tons	

London Metal and Ore Prices appear on page 46.

Mining Finance

Mine or Supermine?

Western Deep Levels, lying down-dip from the West Wits mines, was obviously going to be an extremely expensive operation from the outset. Just how expensive is made clear by the prospectus which has been issued in connection with the forthcoming rights issues of Western Deep shares.

The mine is to be opened up and exploited in three stages. The first stage involves the sinking of the Nos. 2 and 3 shaft systems to a depth of 6,300 ft., which will enable the mine to be brought to production on the Ventersdorp Contact Reef, the shallower (and poorer) of the two reefs to be exploited. At this point, the mill capacity will be 80,000 tons per month. It is not expected that profits will be made until about a year after the completion of this stage, scheduled for mid-1962. The cost of stage one is put at about £18,100,000.

Stage two is somewhat shorter and less expensive than stage one. Immediately the two shafts have been completed to 6,300 ft., work will begin on the sinking of the sub-vertical sections of the two systems to a final depth of 9,700 ft. below surface. This will allow work on the Carbon Leader Reef to begin, and in order to treat ore from this source, the reduction plant will be extended to 120,000 tons monthly. The total cost of this stage will be about £9,000,000, and completion is scheduled for the end of 1964. Stage three, for which neither cost estimates nor time schedule is yet available, comprises the expansion of the mine and mill to a capacity of 200,000 tons per month. This, says the prospectus, will probably involve the sinking of one or two additional shaft systems.

Thus, the cost of bringing Western Deep to a production rate of 120,000 tons per month, with mill feed derived from both reefs, will be more than £27,000,000, of which £5,639,000 had been spent by October 31 last. Expenditure in the period to September next is estimated at £4,750,000, equal to the amount to be raised by the present issue of "A" shares, so that next autumn will probably see the first issue of "B" shares, which only receive dividends after 10s. has been paid on the "A" issue. This fact emphasizes the speed at which shaft sinking and other work has progressed, since in the terms of the original flotation agreement, September, 1959 (two years after the first advance from the "loan syndicate") was the earliest date at which the "A" shares could be issued.

The formal rights offers to shareholders in Blyvooruitzicht, West Driefontein, Wit. Deep and Western Ultra Deep will close on February 16. Official dealings in allotment letters are expected to begin on January 19, but unofficial dealings have been taking place in Johannesburg in which the "A" shares have been quoted at a premium of around 20s.

Whether a premium of such dimensions can be justified at this stage is questionable. The profit prospects for the mine depend, in the last resort, on whether the limited geological informa-

tion available has been correctly interpreted by the loan syndicate's geologists. The two known quantities in their equation were the results of development in the two neighbouring properties, and drilling results on the property itself, which indicate that the reefs continue into the new mine's lease area. What must be remembered is that although the company has tax and lease concessions which will partly offset the expense of mining at the great depths planned, the magnitude of the mine's capital structure, coupled with the inevitable high cost both of day-to-day working and of future capital expenditure, means that both revenue per unit and the number of units must be similarly magnified. Ore that might make a good mine were it 5,000 ft. shallower may be barely payable at Western Deep's, so that exceptional values and payability are essential to the mine's success. There is, of course,

no reason to believe that ore of the necessary calibre will not be disclosed in development. Nevertheless, a 100 per cent premium at this time looks even more of a speculation than most bore-hole gambles.

KILEMBE RIGHTS ISSUE

Kilembe Mines, which is financed by Frobisher Ltd. in conjunction with the Colonial Development Corporation and the Uganda Development Corporation, is to make a rights offer of shares to shareholders. Proposals for the offer have been accepted by the holders of Kilembe's debentures. Frobisher is to underwrite the issue, and may, at Kilembe's option, be required to take up further shares until the end of 1962.

It is to be assumed that the funds raised by the proposed offer will be used in financing Kilembe's 3-4 year expansion programme, details of which were released last November (*M.J.*, November 21). Output, at present averaging 10,000 tons of blister copper annually, is to be stepped up to 15,000 tons per year. To achieve this rate of output, new sources of ore, both deep-mined and open-cut, will have to be exploited.

Kilembe, which is situated in the foot-

LONDON MARKET HIGHLIGHTS

South African gold shares moved irregularly for most of the past week and later turned dull on a varied assortment of bearish factors, among them being rioting in the Belgian Congo. Although it was realized that South Africa was in no way involved, any news of racial disturbances in Africa is always sufficient to make the Kaffir market glance anxiously over its shoulder.

Prices were not helped by the December monthly profit figures. December is never a good month from a profits angle, and on this occasion results were additionally affected by the outbreak of sporadic strikes along the O.F.S. field that occurred during the early part of the month. Largely as a result of this, Free State Geduld came back to 113s 9d., but President Steyn, despite a sharply reduced profit, rose 9d. to 32s. 6d. on Cape and local support. Another bright spot was in Merriespruit, which advanced to 7s. 6d. on hopes that the coming quarterly report will tell of good progress in combating the mine's water troubles.

Winkelhaak wilted to 19s. 9d. on disappointment with a rather modest initial profit announced for December. A more severe setback was seen in Loraine, which after being up to 28s. 3d. in the previous week, steadily fell to 24s. 6d. in front of the quarterly report forecasting a new issue of shares. Similar influences seemed to be at work in Welkom. The share price fell to 19s. 9d., and now that Anglo American has allowed its option on Welkom shares (at 27s. 6d.) to lapse, some arrangements will have to be made to enable Welkom to repay the £2,500,000 loan due to Anglo American at the end of the year.

Platinum shares, which had been recovering for no very apparent reason, turned dull again. The outlook for the metal price remains as obscure as ever,

with free market sales taking place well below the official £19 10s. an oz.

The diamond section, on the other hand, derived considerable encouragement from the December quarter's sales values. These figures showed that gem sales were the best so far achieved in a single quarter, and they also disclosed a sharp rise in industrial stone sales. De Beers moved up to 123s. 9d., and it was wondered if the company might at last break away from the 10s. dividend total paid for the past six years by declaring a higher final in March.

Copper shares might have been expected to go higher in view of the confident manner in which the metal price was edging forward, despite the heavy influx of Rhodesian supplies expected any day now. But Paris selling checked any real rise in share prices, particularly in Bancroft (29s. 6d.) and "Rhoanglo" (80s. 7½d.). Later, the Belgian Congo rioting news produced distinct uneasiness in "Tanks" (54s. 3d.) and Kentan (43s. 3d.). Resisting the dullness were R.S.T., which rose to 19s., and Rhodesia-Katanga, firm at around 18s.; in the case of the latter, there were hopes that with the resurgence of confidence in copper, it might be decided to dewater the Kansanshi mine soon.

Elsewhere, Ashanti moved up to 16s. 10½d. in anticipation of the final dividend. Hopes were more than fulfilled when a payment of 1s. (to make 2s. for the year), a bonus of 6d. and a 1 for 3 scrip issue were announced.

Consolidated Zinc spurted to 67s. 3d. on a so far unfounded hope that the United States interests bidding for British Aluminium might also be interested in that company's partner in the Queensland bauxite project; the rush to take a quick profit on the rise saw "Zincs" back to 62s. 9d. two days later.

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hills of the Ruwenzori Mountains, has been in production for two years, and the earlier development programme, which brought production to a level of 10,000 tons annually, is now virtually completed.

NEW CAPITAL FOR WELKOM AND LORAINE

Two further new issues by South African gold mining companies have been foreshadowed this week. In the annual report of Welkom the chairman, Mr. S. Spiro, points out that for sometime yet distributable profits must be allocated equally between dividends and debenture repayments. Arrangements will also have to be made in respect of the temporary loan facilities of £2,500,000 due for repayment next December. These statements, read in con-

junction with the fact that Anglo American did not take up its Welkom options in December, must mean that a new issue this year is a near certainty.

The other new capital-raising operation forecast by Lorraine in its quarterly report will be made within a year and will call for about £3,000,000 of new money. Terms will be announced shortly.

NEW PEAK IN DIAMOND SALES

Sales of gem diamonds in the last quarter of 1958 reached the new record level of £15,327,135. Industrial sales also made a strong recovery, although the figure of £4,919,480 was still below that for the corresponding period last year. Sales during the last fifteen months are tabulated above.

	1958	Gems £	Industrials £
Dec. qtr. ...	15,327,135	4,919,480	
Sept. qtr. ...	12,844,930	3,227,756	
June qtr. ...	10,734,932	3,199,173	
Mar. qtr. ...	10,513,699	4,776,282	
1957			
Dec. qtr. ...	12,264,006	5,372,053	
Total sales for 1958 were £65,543,387, compared with £76,772,112.			

S.A. GOLD RETURNS FOR DECEMBER

Among the working results of the South African gold producers for the last month of the old year, the one to attract most attention was undoubtedly the first profit announcement from Winkelhaak, the Union Corporation mine pioneering the Bethal area, 60 miles to the east of the East Rand Basin. Although the figures themselves are a trifle disappointing, costs (51s. 8d. per ton) being higher and grade (4.5 dwt.) being lower than might have been hoped, these are early days yet. In fact, only three years have passed since the formation of the company in December, 1955, an unusually brief period for the development of a major South African gold mine. Moreover, a good omen in the first month of "official" production was the fact that the unusual milling methods used enabled the mine to crush 9,000 tons more than the rated capacity of 60,000 tons. The working profit for the month was £16,055.

Elsewhere, results suffered from the effects of the Christmas holiday, which combined with the recent labour unrest in the O.F.S. to produce a contraction in the profits of almost all producers. Notable exceptions were Harmony, whose earnings of £319,921 from gold and uranium constituted a record, and Buffelsfontein, where profits topped the November record of £388,247 by £4,000. At Free State Geduld, a fall in throughput and a sharp rise in costs from 75s. 8d. to 79s. 4d. per ton masked the fact the grade improved from 14.85 dwt. to 15.15 dwt.

Results at two of the older Central Rand properties were distorted by exceptional events. At Rose Deep, a clean-up during the month yielded additional profits of £53,570 (included in the figure of £45,808 given in the table alongside) while one of the not infrequent pressure bursts at Robinson Deep made some of the high-grade stopes unavailable, causing a loss of £23,276.

The assumed gold price for the month was 249s. 9d.

Treselca's First Year.—The report and accounts of Treselca for the period from its incorporation on May 1, 1957, until September 30 last, show a loss of £72,339. This was almost entirely attributable to expenditure incurred through the company's interests in prospecting ventures.

Mr. Pasie's Proof of Debt.—A report from the liquidator of Treppa Mines brings up-to-date the position regarding the second proof of debt which has been put before the court by Mr. Pasie. During the recent sittings the matter was under discussion on four occasions, and after legal argument the Registrar has decided that the normal procedure with regard to contingent claims should be followed. It is now hoped that the claim will be disposed of during the latter part of the Hilary term. Until Mr. Pasie's

Rand and Orange Free State Returns for December

Company	December 1958			Year ends	Current Financial Year Total to date			Last Financial Year Total to date	Profit† (£000)
	Tons (000)	Yield (oz.)	Profit† (£000)		Tons (000)	Yield (oz.)	Profit† (£000)		
Gold Fields									
Doomfontein	87	36,562	188.5	J	525	219,249	1153.2	512	211,644
Libanon	98	23,198	53.8	J	588	138,690	326.5	706	137,765
Luijpaards Vlei	70	12,119	5.8	J	420	72,350	32.9	440	78,378
Riesfontein	18	4,553	9.9	D	250	58,411	143.4	289	67,786
Robinson	67	13,170	123.3	D	863	181,961	6.9	908	187,253
Simmer & Jack	90	17,023	12.0	D	1,059	201,787	163.9	1,152	213,934
Sub Nigel	66	15,893	24.0	J	397	95,782	151.6	396	100,940
Venterspost	119	30,488	50.9	J	769	191,016	353.2	735	176,986
Vlakfontein	50	17,721	85.0	D	596	210,605	1019.3	591	211,811
Vogels	92	20,608	44.6	D	1,141	254,863	529.6	1,185	273,564
West Drie	81	77,520	632.5	J	482	460,472	3769.2	450	431,462
Anglo American									
Brakpan	130	16,759	11.6	D	1,492	198,620	142.4	1,354	220,794
Daggas	230	47,197	249.5	D	2,785	577,156	3033.6	2,718	591,034
East Daggas	91	15,093	27.6	D	1,096	181,484	338.2	1,128	186,973
F. S. Geduld	72	54,554	397.5	S	221	164,334	1200.6	190	134,333
President Brand	96	72,547	602.3	S	290	217,294	1809.1	207	156,614
President Steyn	82	32,175	144.3	S	271	106,071	535.2	277	105,630
S. A. Lands	91	19,058	55.2	D	1,079	232,470	642.7	1,052	224,526
Springs	108	14,589	9.5	D	1,500	173,547	106.5	1,520	167,372
Vaal Reef	78	35,567	203.5	D	882	398,932	2265.0	751	333,314
Welkom	90	27,154	75.6	S	270	81,387	232.1	242	71,398
Western Holdings	96	57,609	436.5	S	296	173,112	1303.3	293	150,267
West. Reefs. Ex.	109	27,363	72.8	D	1,332	319,419	786.3	1,451	340,807
Central Mining									
Blyvoor	105	69,147	502.1	J	625	410,464	2982.3	619	370,108
City Deep	113	23,662	5.1	D	1,511	300,102	122.2	1,780	347,907
Cons. M.R.	121	20,028	15.4	J	879	121,978	88.5	1,020	137,408
Crown	220	34,393	6.1	D	2,751	420,393	176.3	2,836	417,066
D. Roodepoort	185	33,651	52.4	D	2,200	398,322	617.6	2,393	387,188
East Rand Prop.	207	54,053	120.0	D	2,569	675,783	1701.0	2,634	673,663
Harmony	103	42,032	165.6	J	584	234,588	915.3	495	197,745
Modder East	129	13,043	2.4	J	800	79,469	12.2	828	83,518
Rose Deep	34	4,614	45.8	D	615	81,957	27.9	610	90,116
J.C.I.*									
E. Champ. d'Or	12	329	L26.7	D	150	4,268	L326.6	145	4,176
Freddies Cons.	54	13,946	L37.1	D	639	178,805	L467.0	665	192,165
Govt. G.M.A.	60	10,662	L6.0	D	747	134,014	L0.4	1,077	182,647
Randfontein	16	3,364	5.1	D	310	51,252	61.0	711	117,872
Union Corporation									
East Geduld	130	39,974	276.3	D	1,547	475,762	3261.9	1,615	496,042
Geduld Prop.	72	12,680	11.6	D	929	153,791	143.2	1,144	181,321
Grootvlei	195	41,436	207.8	D	2,360	502,074	2553.7	2,356	503,591
Marievale	84	21,632	104.4	D	891	232,567	1050.7	854	224,297
St. Helena	139	40,057	209.6	D	1,468	429,306	2200.4	1,392	405,752
Van Dyk	74	13,503	15.4	D	913	168,135	291.2	919	162,602
Winkelhaak	69	15,498	16.1	D	69	15,498	16.1	—	—
General Mining									
Buffelsfontein	122	41,364	188.2	J	721	243,523	1114.4	664	216,202
Ellaton	31	7,252	31.0	D	382	88,900	380.4	389	85,448
S. Roodepoort	29	7,019	22.9	J	179	42,270	143.4	177	41,588
Stilfontein	125	63,849	420.8	D	1,399	699,212	4544.4	1,231	564,607
W. Rand Cons.	133	18,794	2.8	D	1,642	221,326	165.8	1,669	239,787
Anglo Transvaal									
Hartbeestfontein	87	47,850	329.3	J	522	286,230	1921.4	515	282,415
Lorraine	75	14,625	L18.5	S	223	43,388	L56.9	184	36,145
N. Klerksdorp	10	1,117	L7.6	D	121	13,054	L96.6	138	14,591
Rand Leases	181	26,245	12.0	J	1,082	157,051	70.8	1,050	159,501
Village M.R.	27	4,863	1.5	J	163	28,408	4.0	199	32,197
Virginia O.F.S.	114	29,080	31.5	J	665	173,588	259.1	612	146,218
Others									
Kleinfontein	81	10,673	3.0	D	1,035	128,231	L19.1	1,172	140,059
Wit Nigel	18	4,355	6.0	J	107	25,853	37.2	107	25,542

Gold has been valued at 249s. 9d. (November 249s. 7d.) per oz. fine. L indicates loss. † Working Profit. * Working Profit includes sundry revenue. Table excludes profits from Uranium, Pyrite and Acid, and also production from Uranium divisions at Luijpaards Vlei, Randfontein and W. Rand Consolidated.

News and Results—Continued

claim has been disposed of, no distribution, either of cash or Treselca shares, can be made to stockholders.

Pungah Profits Sharply Down.—The restriction of output as a result of the tin control scheme combined with technical difficulties to reduce the taxed profit for 1957/8 of Pungah Tin Dredging to £6,616 against £29,740 in the preceding year. No dividend was paid, compared with 1s. in 1956/7.

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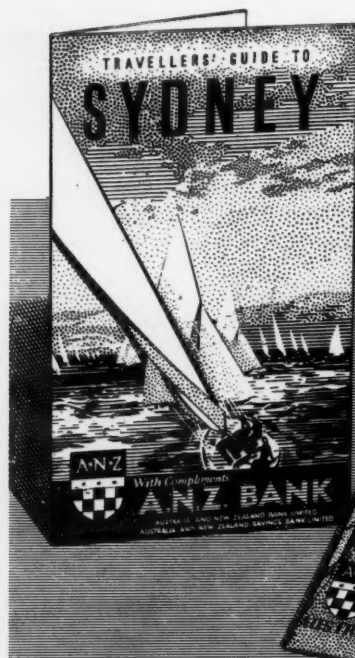
LONDON METAL AND ORE PRICES, JAN. 8, 1959

METAL PRICES

Aluminium, 99.5%, £180 per ton	Iridium, £19/£21 oz. nom.
Antimony—	Lanthanum (98/99%) 15s. per gram.
English (99%) delivered, 10 cwt. and over £190 per ton	Manganese Metal (96% - 98%) £290
Crude (70%) £190 per ton	Magnesium, 2s. 3d. lb.
Ore (60%) bases 1½s. 6d./20s. 6d. nom. per unit, c.i.f.	Nickel, 99.5% (home trade) £600 per ton
Arsenic, £400 per ton	Osmium, £16/£17 oz. nom.
Bismuth (min. 1 ton lots) 16s. lb. nom.	Osmiridium, nom.
Cadmium ½s. 6d. lb.	Palladium, £5/£5 15s.
Cerium (99%) net, £16 0s. lb. delivered U.K.	Platinum U.K. and Empire Refined £19 10s. oz.
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.	Imported £17 10s./£18 0s.
Cobalt, 16s. lb.	Quicksilver, £74 0s. ex-warehouse
Germanium, 99.99%, Ge. kilo lots 2s. 5d. per gram.	Rhodium, £40/£41 oz.
Gold, 249s. 11½d.	Ruthenium, £13/£15 oz. nom.
	Selenium, 50s. 0d. per lb.
	Silver, 76d. f. oz. spot and 75½d. f.d.
	Tellurium, 15s./16s. 10

ORES AND OXIDES

Bismuth	65% 8s. 6d. lb. c.i.f.
Chrome Ore—	18/20% 1s. 3d. lb. c.i.f.
Rhodesian Metallurgical (semifriable) 48%	£15 15s. 0d. per ton c.i.f.
Hard Lumpy 45%	£15 10s. 0d. per ton c.i.f.
Refractory 40%	£11 0s. 0d. per ton c.i.f.
Smalls 44%	£14 0s. 0d. per ton c.i.f.
Baluchistan 48%	£11 15s. 0d. per ton f.o.b. nom.
Columbite, 65% combined oxides, high grade	
Fluorspar—	
Acid Grade, Flotated Material	£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF ₂)	156s. 0d. ex works
Lithium Ore—	
Petalite min. 34% Li ₂ O	40s. 0d./45s. 0d. per unit f.o.b. Beira
Lepidolite min. 34% Li ₂ O	40s. 0d./45s. 0d. per unit f.o.b. Beira
Amblygonite basis 7% Li ₂ O	£25 0s. per ton f.o.b. Beira
Magnesite, ground calcined	£28 0s./£30 0s. d/d
Magnesite Raw (ground)	£21 0s./£23 0s. d/d
Manganese Ore Indian—	
Europe (46% - 48%) basis 55s. 0d. freight	83d./85d. per unit c.i.f. nom.
Manganese Ore (43% - 45%)	70d./75d. per unit c.i.f. nom.
Manganese Ore (38% - 40%)	50d./54d. per unit c.i.f. nom.
Molybdenite (85%) basis	8s. 11d. per lb. f.o.b.
Titanium Ore—	
Rutile 95/97% TiO ₂ (prompt delivery)	£35/£36 per ton c.i.f. Aust'n.
Ilmenite 52/54% TiO ₂	£11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%)	95s. 0d./100s. 0d. per unit c.i.f.
Vanadium—	
Fused oxide 95% V ₂ O ₅	8s./8s. 11d. per lb. V ₂ O ₅ c.i.f.
Zircon Sand (Australian) (65 - 66% ZrO ₂)	£14 0s. per ton c.i.f.



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